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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/830,182

04/22/2004

Andrea F. Gulla

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11/29/2006

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EXAMINER

HAILEY, PATRICIA L

ART UNIT

PAPER NUMBER

1755

DATE MAILED: 11/29/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/830,182

Applicant(s)

GULLA ET AL.

Examiner

Patricia L. Hailey

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 15 September 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,3,5-7,10,12-22 and 36-48 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 3, 5-7, 10, 12-22, 36-40, and 46-48 is/are rejected.
- 7) ☒ Claim(s) 41-45 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_.

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Applicants' remarks and amendments, filed on September 15, 2006, have been carefully considered. Claims 2, 8, 9, and 11 have been canceled; no new claims have been added.

Improper status modifiers for claims 2, 8, 9, and 11 have been used, i.e., "Cancel Claim 2", instead of "Claim 2 (cancelled)." However, as Applicants appear to have intended to cancel these claims, they will be interpreted, for the purposes of examination, as cancelled.

Claims 1, 3, 5-7, 10, 12-22, and 36-48 remain pending in this application.

### ***Withdrawn Objections and Rejections***

The objection to claims 2, 3, and 5-48 stated in the previous Office Action has been withdrawn in view of Applicants' amendments.

The 112(1) rejection of claims 1-3, 5-22, and 36-48 stated in the previous Office Action has been withdrawn in view of Applicants' amendments.

The art rejections maintained in the previous Office Action have been withdrawn in view of Applicants' amendments.

### ***New Grounds of Rejection***

However, any indication of allowable subject matter stated in the previous Office Action has been withdrawn in view of the newly discovered reference to Forquy et al. (U. S. Patent No. 5,166,362), and in view of the Examiner's reconsideration of the currently pending claims.

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

***Claim Rejections - 35 USC § 112***

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. ***Claim 19 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.***

Claim 19 is indefinite because the phrase "the molar ratio of said nitrogen sulfide" lacks antecedent basis. Claim 12, from which claim 19 depends, does not recite "nitrogen sulfide".

It appears that said phrase is intended to read: "the molar ratio of said nitrogen to hydrogen sulfide".

***Claim Rejections - 35 USC § 102***

3. ***Claims 1, 5, 7, 10, 12, 13, 15-19, and 46-48 are rejected under 35 U.S.C. 102(b) as being anticipated by Forquy et al. (U. S. Patent No. 5,166,362).***

Forquy et al. disclose a catalyst comprising ruthenium sulphide in either bulk or supported form, as well as a mixture of sulphides of ruthenium and at least one other transition metal selected from the group consisting of, inter alia, cobalt, wherein the proportion of metal other than ruthenium in the mixture is "up to 80 by weight". See col.

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2, lines 22-38 of Forquy et al., which, at lines 27-30, also discloses active carbon as an exemplary support (considered to read upon **claims 1, 7, 10, and 46**).

For the preparation of supported catalysts, the support is impregnated with one or more metal salts, (for example, chlorides), followed by direct sulphurization with a mixture of hydrogen and H<sub>2</sub>S (2 to 50% by volume, preferably approximately 15%), or with H<sub>2</sub>S diluted in an inert gas (for example, nitrogen) at a temperature between 300°C and 700°C. These temperature treatments are preferably carried out in the reactor. See col. 2, lines 52-66 of Forquy et al. (considered to read upon **claims 5, 12, 13, 16, 17, and 47**).

Example 2 of Forquy et al. depicts drying of an exemplary catalyst precursor at a temperature between 100°C and 200°C, followed by sulphurization at 400°C for 4 hours. See col. 4, lines 35-39 of Forquy et al. (considered to read upon **claims 15, 18, 19, and 48**).

Because this reference discloses a mixed sulfide supported on carbon, as recited in the instant claims, the catalyst of Forquy et al. is expected to function as an “electrocatalyst for oxygen reduction”, therefore, this limitation is considered inherently met by Forquy et al.

In view of the above teachings, Forquy et al. anticipate claims 1, 5, 7, 10, 12, 13, 15-19, and 46-48.

***Claim Rejections - 35 USC § 103***

***4. Claims 3 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Forquy et al. (U. S. Patent No. 5,166,362) in view of Ito et al. (U. S. Patent No. 6,649,300).***

Forquy et al. is relied upon for its teachings in the above 102(b) rejection.

Although this reference discloses active carbon as an exemplary support (col.2, lines 27-30), Forquy et al. do not disclose a surface area for said active carbon.

Ito et al. at col. 3, lines 49-65 disclose that carbons can exhibit a BET surface area of 240 m<sup>2</sup>/g.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Forquy et al. by employing an active carbon, such as that disclosed by Ito et al., and thereby obtain Applicants' invention as set forth in claim 3.

As claim 6 in its present form is a product-by-process claim ("obtained by..."), it has been held that "[A]ny difference imparted by the product by process limitations would have been obvious to one having ordinary skill in the art at the time the invention was made because where the examiner has found a substantially similar product as in the applied prior art the burden of proof is shifted to the applicant to establish that their product is patentably distinct, not the examiner to show that the same is a process of making." In re Brown, 173 U.S.P.Q. 685 and In re Fessmann, 180 U.S.P.Q. 324.

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**5. Claims 20-22 and 36-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over “Methanol Tolerant Oxygen Reduction Catalysts Based on Transition Metal Sulfides”, by R. W. Reeve et al. in view of Forquy et al. (U. S. Patent No. 5,166,362).**

The Reeve et al. article discloses carbon-supported transition metal sulfide electrocatalysts such as  $\text{Mo}_x\text{Ru}_y\text{S}_z$ . See page 3563 of the article, under the heading “Experimental”.

The article also discloses gas diffusion electrodes prepared by applying catalyzed carbons to Teflonized carbon paper substrates using Nafion (**claims 20-22 and 36-40**). See page 3464 of the Reeve et al. article, the paragraph entitled “Electrode manufacture”.

Forquy et al. is relied upon for its teachings as stated in the above 102(b) rejection. Although this reference teaches a catalyst reading upon Applicants’ electrocatalyst as recited in claims 1, 5, 7, 10, 12, 13, 15-19, and 46-48, Forquy et al. do not teach or suggest the limitations of Applicants’ claims 20-22 and 36-40.

However, Forquy et al. disclose, in addition to cobalt, molybdenum as an exemplary transition metal suitable for constituting Patentees’ “mixture of sulphides of ruthenium and at least one other transition metal” (col. 2, lines 31-38).

Therefore, because these two were art-recognized equivalents at the time the invention was made, one of ordinary skill in the art would have found it obvious to substitute cobalt for molybdenum, given the equivalence between molybdenum and

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cobalt in preparing a catalytic mixture of metal sulphides, as set forth in Forquy et al., and thereby obtain Applicants' claimed invention as recited in claims 20-22 and 36-40.

**6. Claims 1, 3, 5, 7, 12, 14-19, 47, and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kobylinski et al. (U. S. Patent No. 3,840,389) in view of Forquy et al. (U. S. Patent No. 5,166,362).**

Kobylinski et al. disclose catalysts prepared by coating a support (such as refractory oxides, or activated carbon, said support exhibiting a surface area from about 10 m<sup>2</sup>/g to about 500 m<sup>2</sup>/g; see paragraph 5) with a metal sulfide selected from the group consisting of (1) the sulfides of ruthenium and/or rhodium and (2) the sulfides of ruthenium and/or rhodium in combination with one or more of the sulfides of platinum, palladium, osmium, or iridium, and the product resulting therefrom. See paragraph 1 of Kobylinski et al. (considered to read upon **claims 5, 7, and 8**).

The catalysts are prepared by impregnating the support (e.g., the refractory oxide) with a solution, aqueous or alcoholic, containing a dissolved salt of the aforementioned metals (ruthenium, rhodium, etc.). Suitable salts include chlorides and nitrates; when an alcoholic solution is employed, any suitable alcohol (e.g., propanol), is satisfactory. Suitable impregnation can be obtained over a period ranging from about 15 minutes to about 6 hours; the temperature of treatment ranges from about 15° to about 95°C. Pressure is not critical (considered to read upon the limitations of **claim 15**) but generally atmospheric pressure will suffice. See paragraph 6 of Kobylinski et al.



The impregnated support is then treated with  $H_2S$  to precipitate the corresponding metal sulfide under conditions similar to those employed for impregnation. The impregnated support may also, if wet with water or alcohol after treatment with  $H_2S$ , may be dried at temperatures ranging from about  $80^{\circ}C$  to about  $180^{\circ}C$ . Drying can be effected in air, an inert atmosphere (such as nitrogen or  $H_2S$ ). Further, the catalyst is preferably subjected to calcination at temperatures ranging from about  $400^{\circ}C$  to about  $600^{\circ}C$ ; as in the drying step, calcination can be effected in air, an inert gas, such as nitrogen, or even  $H_2S$ . See paragraph 8 of Kobylinski et al. (**claims 11, 14, 16-19, 47, and 48**).

Kobylinski et al. does not explicitly disclose that the catalyst is an "electrocatalyst", or that the support is "electrically conductive". However, because the reference teaches the same components as recited in Applicants' claims as the "electrocatalyst" and the "electrically conductive" support, it would have been obvious to one of ordinary skill in the art at the time the invention was made to reasonably expect that the catalysts of Kobylinski et al. would function as an "electrocatalyst" absent the showing of convincing evidence to the contrary.

It is well settled that when a claimed composition appears to be substantially the same as a composition disclosed in the prior art, the burden is properly upon the applicant to prove by way of tangible evidence that the prior art composition does not necessarily possess characteristics attributed to the CLAIMED composition. In re Spada, 911 F.2d 705, 15 USPQ2d 1655 (Fed. Circ. 1990); In re Fitzgerald, 619 F.2d 67,

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205 USPQ 594 (CCPA 1980); In re Swinehart, 439 F.2d 2109, 169 USPQ 226 (CCPA 1971).

Kobylinski et al. also do not disclose a mixed sulfide of ruthenium and cobalt, as instantly claimed.

Forquy et al. disclose a catalyst comprising ruthenium sulphide in either bulk or supported form, as well as a mixture of sulphides of ruthenium and at least one other transition metal selected from the group consisting of, inter alia, rhodium, palladium, or cobalt, wherein the proportion of metal other than ruthenium in the mixture is "up to 80 by weight". See col. 2, lines 22-38 of Forquy et al., which, at lines 27-30, also discloses active carbon as an exemplary support. Note that rhodium and palladium are also disclosed in Kobylinski et al.

For the preparation of supported catalysts, the support is impregnated with one or more metal salts, (for example, chlorides), followed by direct sulphurization with a mixture of hydrogen and H<sub>2</sub>S (2 to 50% by volume, preferably approximately 15%), or with H<sub>2</sub>S diluted in an inert gas (for example, nitrogen) at a temperature between 300°C and 700°C.

In view of the similarities between Kobylinski et al. and Forquy et al., it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of Kobylinski et al. by substituting cobalt for either rhodium or palladium, as suggested by Forquy et al, and thereby obtain Applicants' claimed invention.

***Allowable Subject Matter***

7. Claims 41-45 remain objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

***Conclusion***

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Patricia L. Hailey whose telephone number is (571) 272-

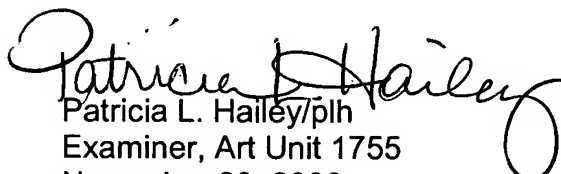
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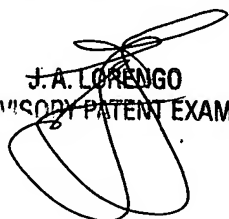
1369. The examiner can normally be reached on Mondays-Fridays, from 7:00 a.m. to 3:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jerry Lorengo, can be reached on (571) 272-1233. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group 1700 Receptionist, whose telephone number is (571) 272-1700.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

  
Patricia L. Hailey/plh  
Examiner, Art Unit 1755  
November 20, 2006

  
J.A. LORENZO  
SUPERVISOR PATENT EXAMINER